GEOGRAPHIC SCHOOL BULLETINS

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VOLUME XXXVI, NUMBER 15, JANUARY 27, 1958 . . . *To Know This World, Its Life*

► Peru, Land of Three Faces
► Guided Missile of the Stone Age
► That Playboy—The Otter
► The Mason and Dixon Line
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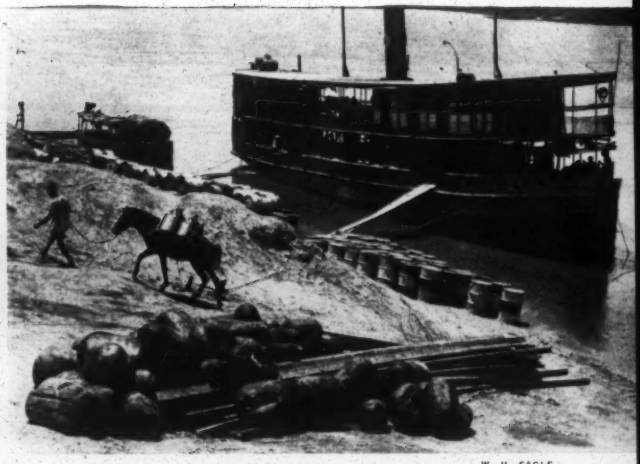
NEXT WEEK: **The mysteries of mountainous Burma and how high-flying weathermen pepper clouds with crystals to produce rainfall.**

Tiny Peruvians near Lima mimic the dress of their elders—borrowed from Inca and Spanish cultures—but the miniature Coke bottle dangling from the girl's sash is her own idea.

J. A. RANKIN

It has room for three distinct geographical faces. Away from the Andes—the *sierra* section of Peru—the Inca influence is submerged under the 20th century drive and prosperity of coastal cities. Lima, the capital, and Callao, its seaport, hold roughly a tenth of all Peruvians—national population is nearly 10,000,000.



W. H. EAGLE

Many citizens wear the handsome looks of Spanish ancestors who first came with Pizarro. Lima's businessmen hurry past gracious buildings of ornate Spanish architecture, past vistas with equestrian statues, past cathedrals, up-to-the-minute hotels, and fashionable shops, to their offices in handsome new buildings. Mining developments and petroleum production occupy their minds. But they may take time out to watch an imported bullfight (straight from Madrid) or a baseball game between teams largely made up of Japanese immigrants.

Lima is proud of its museums and its University of San Marcos, the oldest in the Americas. It was founded by Dominican friars 85 years before Harvard —as any Peruvian, or Yale man, will gladly point out to a visitor.

Rain seldom falls around Lima, though the Pacific's Peru Current keeps the city cool. But a flight over the coastal region north of the capital emphasizes the dryness of this narrow belt of land between mountains and sea. In places, sand dunes form a wavelike pattern. Small coastal streams snake through the slim desert like miniature Niles—their banks turn bright green during the wet season. In Peru's dry regions water must sometimes be shipped by vessel. The river boat above is unloading water cans at an eastern jungle settlement, making room for crude rubber. Irrigation projects, left, will cut through mountains bringing Andean water to the arid coast. Most mountain streams, rising perhaps only 200 miles from the Pacific, drain into the Amazon Basin and flow into the Atlantic, nearly 4,000 miles away.

INTERNATIONAL COOPERATION ADMINISTRATION

South of Lima the coastal region is cool enough to feel the effects of ocean fogs. Alfalfa and cotton color the slim riverside plantations.

HANS MANN

Golden Civilization Is Gone, but Inca Ways Linger in . . .

PERU

FIVE hundred years ago, when imperial Incas ruled what is now Peru, wayfarers journeyed from one mountain-walled valley to another along a 10,000-mile system of paved highways. With each traveler plodded shaggy, long-necked llamas, some carrying burdens, others being herded along to provide food for the future.

Anywhere in the mountainous sections of today's Peru the scene may repeat itself. Quechua descendants of the Indians who flourished in the golden age of the Incas speak much the same language as their forebears. They eat many of the same foods grown on the same terraced plots that their ancestors built and irrigated on steep mountain walls. They play age-old tunes on the same kind of flute that once piped at sun-god ceremonies.

Llamas still trudge beside them, furnishing meat, clothing, and labor, halting or turning around at hissed commands. After all these centuries the Peruvian Indian gets along passably with his llama, though the beast has changed neither its haughty manner nor unlovely habits. It has been described as "perpetually wearing the expression of an outraged spinster." When it considers itself overloaded—it can carry about 100 pounds—it expresses its outrage calmly and effectively. Instead of trying to buck the load off, the llama lies down and sometimes spits, with dignified contempt, at its master.

The Inca imprint lingers in Andean towns, in the weird ruins of Machu Picchu, straddling a misty mountain saddle, forgotten for centuries until uncovered by three National Geographic Society-Yale University expeditions. Inca-built temples, their hand-ground stones fitting perfectly without mortar, form foundations for many later Spanish buildings in Cusco, the ancient Indian capital. Though earthquakes have tumbled some of the Spanish frosting, the Inca cake has stood firm.

Peru, third-largest South American nation, is nearly twice the size of Texas.

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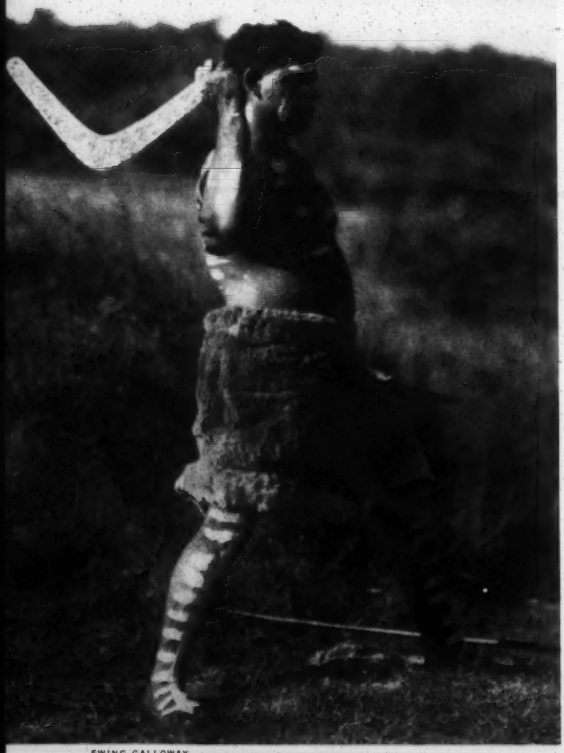
Boomerang, Primitive Missile

WE think of guided missiles as the newest weapon in man's arsenal. But is not the boomerang, hurled by Stone Age Australian aborigines for untold centuries, also a guided missile utilizing aerodynamic principles? An expert heaves it hard at a house. At the last moment it ascends, clears the roof, and whirls down on the other side. Another thrower accurately knocks an apple from his own head, in William Tell fashion. Others dispatch the missile at 50 miles an hour for 140 yards. There, it rounds a tree, humbling the best pitchers' curves.

Some Australian "abos" can hurl the kiley (the native name) upward 150 feet where it circles five times, then bounces on the ground, and returns to its sender. Sometimes the kiley may bean its owner, or, like a foul ball, crown a spectator. This occurs often enough to make boomerang synonymous with something that uncomfortably backfires.



EWING GALLOWAY

Some say the Australians put the homing instinct in boomerangs. Certainly ancient Egyptians used throwing sticks, possibly returning ones. Their skilled hunters felled birds rising in flight and used trained cats to retrieve them. Some Egyptian army units wielded war boomerangs (the heavier non-returning kind) until the 20th century. Boomerangs are fashioned from steel or ivory in India. A weapon similar to a boomerang survives to the present time in northeast Africa. Ethiopia, Celebes, and Borneo had their versions. Hopi Indians of the American Southwest still use an S-shaped throwing stick.

Boomerangs may well be man's first experiment in aerodynamics. In northwest Australia, boomerang fashioners make one side flat, the other convex, and both ends sharply pointed. One end is twisted upwards, the other downwards from front to back. The returning boomerang has been likened to two blades of a propeller, joined at an angle of from 70 to 120 degrees, and bent upwards slightly from the joint. The sweep of air over such unevenly curved surfaces, along with the over-all circling motion, compels the missile to return. One physicist describes the boomerang as a "combination of helicopter, discus, gyroscope, and inclined plane."

The boomerang is now mostly used for fun or serious competition. Australians produce them commercially, as do other nationalities. It's a ticklish business. Badly built ones just don't come back.

UMI

Inland, nestling among volcanoes, lies Arequipa, Peru's third city and birthplace of numerous revolutionists. Above the town looms the perfect cone of El Misti, 19,000 feet high, as well known in South America as is Fujiyama in Japan.

The Arequipa area is as rich in wood and cotton as in scenery and patriotism. Shipments of farm crops funnel through Mollendo. Besides cotton, Peru's arable land produces sugar and foods that nourished the Incas and still support their descendants—corn, potatoes (they originated here), and a cereal known as *quinua*.

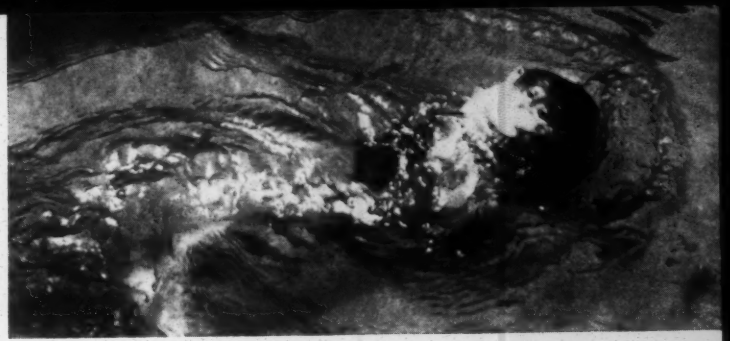
Vast shipments of guano, scraped from coastal islands inhabited only by birds, once formed a profitable Peruvian export. But the guano business has slumped. Minerals have risen in its place—copper, lead, zinc, and the gold and silver that first lured Spanish conquistadors. Oil strikes a few years ago brought North American investments. Lately, oil production has tapered off.

Peruvians are now taking more notice of their country's third geographic region—the *montaña*, the area east of the Andes that looks rather white and bare on most maps. One reason for its lack of cartographic detail is that the region has never been thoroughly explored. It is mainly a thick, soggy jungle, gathering uncounted trickles of water into the still youthful Amazon.

The montaña differs totally from the rest of Peru. While the other two regions feel cool Pacific breezes or the bone-chilling frosts of the Andes, this jungle consistently swelters. Though trees grow meagerly along much of the arid coastal belt and find poor footing on precipitous mountain slopes, they smother the montaña in almost limitless variety. This wealth of timber—and the possibility of unplumbed treasures of minerals—excite Peruvian hopes. Those who probe this wilderness find primitive savages, far removed from the stocky Quechuas and Aymarás of the sierra region. The Incas left little influence on the montaña's naked jungle tribesmen.—E.P.

AYMARÁ INDIANS collaborate to thatch the roof of an adobe-covered field stone house

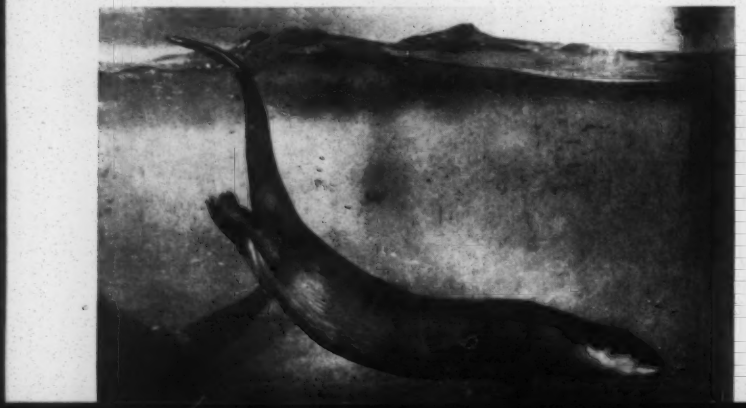
HARRY TSCHOPIK, JR.



comes when Emil toots on his tooter and two otters come bouncing down the aisle onto the stage.

In addition to being a comic, the otter, in his natural state, is a wanderer. He longs for travel, a new den beneath a river bank, fresh hunting grounds. An otter family, roving its range, can cover up to 50 miles fortnightly with regularity. The wandering ceases only in the winter freeze and while the female bears and rears her cubs in the early spring.

A close-up of a land otter, his nose pressed against the glass of his cage (above) shows the powerful, stubby legs that end in the webbed paw so useful for swimming. The broad, flat head tapers to a blunt muzzle. The puffy upper lip hides strong muscles that give him a bite like a bear trap. Thick, stiff whiskers serve as antennae underwater when searching for food. His dense fur is a glistening brown, the smooth sheen broken only by a patch of light fur at the throat. And if the black eyes seem to twinkle, that gives the proper impression of the personality of this happy comic, this aquatic Danny Kaye.—A.P.M.



THAT PLAYBOY—THE OTTER

Nature's clown and man's companion

Photographs by John E. Fletcher, National Geographic Staff

OF ALL American animals, the otter seems to enjoy his fun most. A family of these sleek creatures will dart through the water like small dolphins, playing follow the leader, humping, diving, twisting, then popping to the surface to rub noses, Eskimo style.

Papa Otter climbs a smooth, steep stream bank. Tucking his forepaws close to his body, he pushes off and belly-flops down the slope, hitting the water in a cloud of spray. Close on his heels come Mama and the kids. Then back up the bank, in exactly the same family order, and *zoom*—down the slide they go again. When winter whitens his play yard, the otter doesn't mind. Now he can skid delightedly up to 60 feet across the iced-up stream.

Otters frolic throughout most of the United States, but one pack at Homer, Minnesota, has even more fun than most. They are the charges of Emil Liers, broad-shouldered, soft-hearted man who has devoted a lifetime to raising and training what he calls "the smartest animal in the world."

At a toot from Emil's police whistle, bundles of shiny fur come tumbling from everywhere. One dives through a cutout hole in a screen door and down the steps. Another, looking like a dachshund with a large tail, comes humping around the house corner.

Bounding across the lawn, they hop into Liers's station wagon. After a drive to a backwater of the near-by Mississippi River, they cascade out of the car into a waiting rowboat. Graciously allowing their guardian to do all the work, they ride proudly into the stream where they dive in like a miniature water polo team. An otter's whiplike tail and webbed paws make it easy for him to flip to his back (upper right) and float like a housewife at Coney Island. After the aquatic gambol, another whistle brings the troop back for the ride home.

Liers has trained more than 200 otters. He sends them to zoos and to people as pets—"only fur-bearing animal that makes a real pet," he claims. He has also given more than 3,500 talks to high school, civic, and club audiences. Highlight of each talk

ware and Maryland remained in the Union during the Civil War, that western Virginia counties stood with the North as a new State, West Virginia.

One poll revealed that nine out of 10 persons believed the Mason and Dixon Line resulted from the Civil War. Actually, a whole century separated the two events.

Mason supposedly was born in 1730; tradition puts Dixon's birth in a coal mine. Certainly, both were respected assistants at the Greenwich Observatory during the late 1750's; in 1760 the Royal Astronomical Society chose them to observe the transit of Venus in Sumatra. A month after their invited appearance in America, they took oaths to the boundary duty, with warnings against indiscriminate cutting of fruit trees along the route.

Mason and Dixon's survey developed from a legal decision of 1750, demanding the setting of firm boundaries between Maryland and Pennsylvania on the north, and on the east between Maryland and Delaware, then a part of Pennsylvania.

The surveyors first verified the Maryland-Delaware line, which had been arrived at by marking a straight course west from Cape Henlopen to Chesapeake Bay. At the exact mid-point of this line they went due north until establishing a tangent with the arched northern boundary of Delaware. This arc, of 12-mile radius, was centered on New Castle. It remains the only circular state boundary.

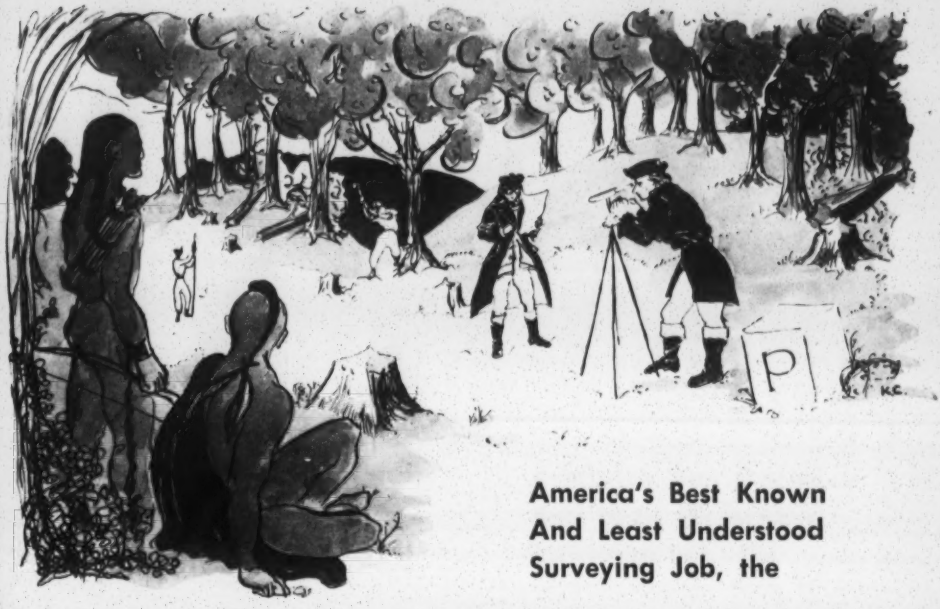
Mason and Dixon then carried the line of the Delaware-Maryland boundary due north until it intersected a course drawn straight west from the point where the Schuylkill River flows into the Delaware. This point, in south Philadelphia, was the northernmost limit of Maryland's claim. Since the Mason and Dixon Line was essentially a compromise, the surveyors lopped 15 miles off Maryland's claim by returning south that distance and setting a stone marking Maryland's northeast corner. This stone was near but not exactly on the point where the 12-mile arc of north Delaware strikes the west Delaware boundary—a happenstance that still creates confusion. From that stone, with a location so deviously yet logically arrived at, Mason and Dixon ran their famous line due west.

They hacked their way, marking their memorable tracks with stone blocks brought over as ship ballast from England. These monuments were inscribed with the arms of Penns and Calverts, and placed at five-mile intervals. Simpler stones, cut with the letters P and M (Pennsylvania and Maryland), marked the miles between. Geographers note that Mason and Dixon's path lies only one degree of latitude north of Lisbon, nearly 12 degrees south of London.

The rough job held natural delights. Wild, beautiful country straddled the survey. The wood-fringed Susquehanna River crossed the Line near the survey's eastern end. Deep, rich soil and abundant foliage stretched westerly from the river

The Mason and Dixon Line skimmed close to historic sites like Fort Necessity, where Washington fought (and lost) his first battle. This map of colonial days shows what is now West Virginia still a part of Virginia.

UMI



America's Best Known And Least Understood Surveying Job, the

MASON-DIXON LINE

MILE upon laborious mile trees toppled to swinging axes, opening vistas 24 feet wide. At each clearing, a man crouched at an instrument. Another jotted figures, seemingly strange symbols, upon paper. Sharp orders cracked. Men with animal muscles and frontier faces heaved heavy oblong stones into places precisely pointed out for them.

Half-naked Indians sometimes appeared to squat and watch, suspicious, understanding nothing of what they saw. What was all this tree felling and squinting through metal tubes? The white men could define the job but had no idea of its historic implications. Charles Mason and Jeremiah Dixon, British surveyors and astronomical computers, had been summoned to the American colonies to clarify the land holdings of the Penn and Calvert families. They were using their uncontestable instruments to end a decades-long dispute about boundary rights.

They did their job between 1763 and 1767, laying a ruler-straight boundary between Maryland and Pennsylvania—the Mason and Dixon Line. It ranks among the first notable boundaries established by competent survey in this country. The two surveyors dramatically shaped American geography. For had all Pennsylvania's previous claims been acknowledged, Baltimore now would be Pennsylvanian, with Maryland reduced to a negligible blob on the map. On the other hand, had Maryland's contentions stood, its boundary would embrace some of Philadelphia.

Mason and Dixon simply did a hired job for the litigants without thought of fame. They couldn't have foreseen the linkage of their names into such a world-wide renown as, say, Gilbert and Sullivan, Lewis and Clark, Barnum and Bailey, Sears and Roebuck. They certainly didn't foresee the popular Mason-Dixon confusions that have since cropped up.

Many people still accept the Mason and Dixon Line (with imaginary extensions) as a realistic division of the North and South. This ignores the fact that Dela-

Zanzibar

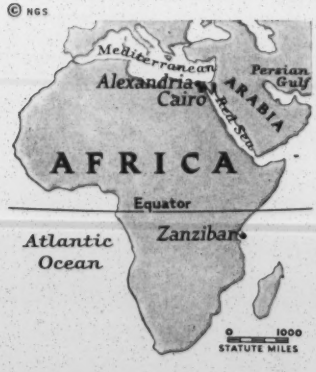
Clove trees, Arabian dhows, henna-rinsed donkeys flavor this British protectorate

CORRY BEVINGTON, PIX

IF THE balconied street in the town of Zanzibar (right) seems remote from your life remember that whenever you taste cloves in a helping of ham, Zanzibar reaches out to your table. Its multitudinous trees provide most of the world's demand for the pungent spice—and the demand goes way back. Records say that cloves were used as breath perfumers in Chinese court circles around 226 B. C.

Zanzibar and its sister island, Pemba (another clove producer), bask in the Indian Ocean some 25 miles off Tanganyika. Here, Dr. David Livingstone assembled his 19th century expeditions to mainland Africa.

Long ago, slave traders bloodied Zanzibar with inhuman cruelties. Around A.D. 60, a Greek traveler observed that ships brought hatchets, glass, awls, and daggers to the island and departed with coconut oil, rhinoceros horn, ivory, and tortoise shell. Persians, Indians, and Arabs arrived, along with some Chinese. Following the wake of Vasco da Gama, Portuguese established trading ports in Zanzibar during the early 1500's. Arabs ousted the Portuguese two centuries later. In 1890, the Sultan arranged for a British protectorate. In all, a lot of activity has hummed in this modest, 650-square-mile piece of earth.



Present-day Zanzibar wears relics of its past. High-pooped Arab dhows still come to the island. Sailing down on the northeast monsoon, they bring dates, Persian carpets, dried shark, incense, and intricate brassware. They turn homeward loaded with sugar, tea, coffee, and mangrove poles.

While ashore, crewmen strut through dockside streets. Children stare at their whiskers, their long-skirted gowns, their eyes that blaze like the overhead sun. From their sashes protrude the hilts and ornamented silver sheaths of frightening J-shaped daggers. No wellborn Arab in Zanzibar feels well dressed without such a blade at his waist. Women prefer anklets and bracelets.

Much of Zanzibar town seems designed in the

for some 60 miles—a land of fine farming today. Though the Line had no particular Civil War significance, two savage battles raged near it—decisive Gettysburg and bloody Antietam. North and south of the Line, Pennsylvania "Dutch," Quakers, and Scotch-Irish Presbyterians built homesteads and cultures that have enriched the entire United States.

Mason and Dixon surveyed some 244 miles west of the Delaware before calling a halt in the face of the Indian menace. They didn't quite finish their task as planned, though it has since been determined that they went some 30 miles beyond what is now the northwest corner of Maryland. The accuracy of their calculations is astonishing, considering their crude instruments, the strange terrain, and vexations of Indians. The latitude of the line, which its surveyors had computed as 39 degrees 43 minutes 17.6 seconds, was later determined to be 39 degrees 43 minutes 19.91 seconds—meaning a difference of only 180 feet.

BALTIMORE SUN MAGAZINE

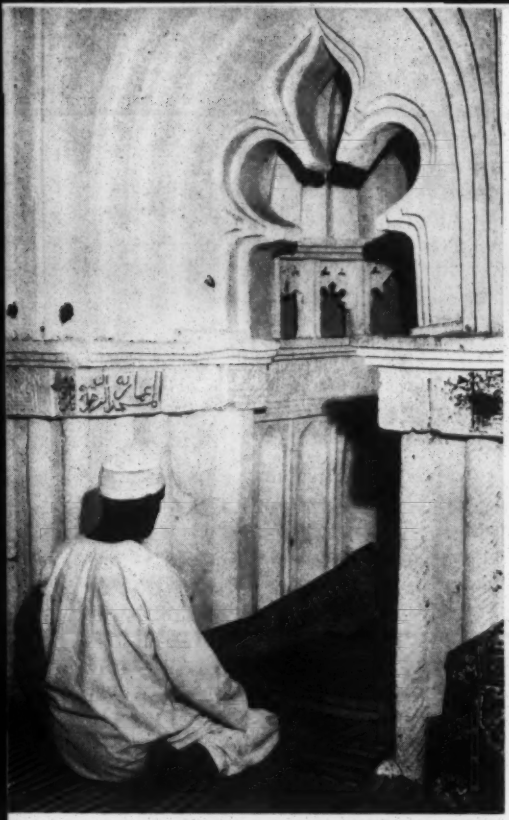
But controversy over the boundary died hard. At the eastern end of the line a small triangle of territory in dispute between Delaware and Pennsylvania became a veritable no man's land of confused jurisdiction. Tax claims and regional loyalties clashed. A mid-19th-century resurvey brought this tract of some 840 acres to Pennsylvania. But controversy continued, and a second resurvey endowed the triangle to Delaware.

What of the carved stones that Mason and Dixon clamped their long line upon? Many are still standing. Others disappeared, but were painstakingly tracked down by at least one Maryland hobbyist of the Line. One stone had been uprooted from the Maryland-Delaware line at Marydel for exhibition at the St. Louis Exposition of 1904. Others have shown up in museums.

A few lie buried beneath road gradings, or in waters behind man-made dams. The search goes patiently along. None less than Moses proclaimed a mandate in the matter: "Thou shalt not destroy thy neighbor's landmark"—Deuteronomy 19:14.—S. H.

MARYLAND'S WESTERN NECK, at Hancock, squeezes between Mason-Dixon Line, near top of picture, and the Potomac River, flowing under this bridge

CHARLES BAPTIE



spirit of the Arabian Nights. White buildings overlook labyrinthine lanes and Oriental bazaars, jabbering a medley of voices. Arabia and Cairo come to visitors' minds. But there are no dominating minarets. Mosques are small, truthful to the Ibathi Moslem belief in simplicity. Exquisitely carved Arab doors dominate white walls. Their heavy panels, frames, and lintels bear patterns of lotus, arabesques of frankincense, and texts of the Koran.

PHOTOS BY W. ROBERT MOORE, NGS STAFF

A ZANZIBAR MOSQUE, small, yet ornately carved, hears Moslem prayer. Cloves, right, are nearly full size.

Roads thread from Zanzibar town through the 55-mile-long island, showing startling contrasts. Frond-canopied coconut groves, tropical gardens, and glossy-green clove trees adorn the rich, low hills of the western side of Zanzibar. To the east and south lie rough bush and open spaces of coral outcrop.

Ruins of old palaces strew the west coast, bleaching beneath age and vegetation. Cities that once pulsed with ancient trade now lie near to obliteration. Occasionally a donkey, dyed with henna, may amble past bearing an Arab farmer. The custom of tinting donkeys—and sometimes beards—with henna was once popular. No one knows why.

For local celebrations, Zanzibar dancers whirl to the throb of drums, the rattle of baskets of seeds suggesting the gourd rattles of faraway Latin America but pitched to African rhythm.

But in worktime, Zanzibar folk are busy with the cloves that scent their island. The trees are ready for picking when the nail-like calyxes of the buds turn green. Women and children pluck the bunches of buds off the lower branches. Spry men climb ladders, or squirrel up into the branches to draw clusters with hooked sticks. Workers brush bunches together to separate stems from buds. The buds fall, and stems are tossed aside. Buds are dried on open concrete platforms to seal in their aromatic oil. Next thing you know, their knobby black heads are protruding from that succulent ham.—S.H.

National Geographic Magazine, Feb., 1952, "Clove-scented Zanzibar" ($1.00).